

Draft Plan of Study

JOINT CANNERY FISH TISSUE STUDY

Special Condition H

**StarKist Samoa
NPDES Permit AS0000019**

**COS Samoa Packing
NPDES Permit AS0000027**



25 May 2001

1. Introduction

Special Condition H of the NPDES Permits issued to StarKist Samoa and COS Samoa Packing require a one-time fish tissue study to be conducted in the first year of the permit. The permit condition allows the canneries to perform a joint study, which is the approach described in this plan of study (POS). It is generally recognized and accepted that the canneries are unlikely to be contributing toxic pollutants to Pago Pago Harbor that result in contamination of fish consumed by local residents. This conclusion is based on the past effluent and water quality data collected over the past 8 years, under the canneries' previous NPDES permits. This study is being conducted as a portion of the overall Receiving Water Quality Monitoring conducted by the canneries.

The permit outlines the general study approach, but it requires that a POS be submitted to USEPA and ASEPA for approval. CH2M HILL project staff held preliminary discussions with ASEPA and USEPA and have agreed, in principle, to modify the nature of the study as described in the NPDES Permits to better reflect the objectives of the study and to provide more appropriate and valuable information to the agencies within the context of previous and ongoing investigations. This plan of study reflects those discussions.

1.1 Objectives and Rationale

The objective of the study is to investigate and quantify the exposure potential (primarily to metals) of the consumers of fish harvested from the Inner Harbor of Pago Pago Harbor. To maximize the ability to attain this objective, this study will be targeted specifically at fish caught along the shoreline and within the Inner Harbor and consumed by residents. The collection of fish will not be based on a limited list of specific target species, nor will the study attempt to compare the tissue analyses from Inner Harbor sites and reference stations. It is noted that previous and ongoing Tier 2 studies by ASEPA have and will address the technical questions of how fish tissue metals concentrations vary around Tutuila Island and at defined reference sites.

The value that this study will provide is specific data on fish tissue metals concentrations in the fish caught in the Inner Harbor that are routinely consumed by children and adult residents. This will provide invaluable supporting data to the other studies being conducted by ASEPA and will provide screening level information that can be used to expand and further develop approaches for any future human health risk assessments related to the Inner Harbor and fish consumption.

1.2 Approach

Fish samples will be obtained by project staff on site in American Samoa to collect water and sediment quality samples during the 2001 Tradewind sampling period scheduled for early September 2001. Fish being caught for human consumption in the Inner Harbor will be obtained either directly from residents as they are caught or local residents will be hired to work with project staff to collect specimens that are normally and regularly caught and consumed. Fish collections will not be biased toward particular species, but will be implemented to represent the fish routinely caught in the Inner Harbor for human consumption.

1.3 Scope of the Study

The study will attempt to use three species, or groups of closely related species, that are normally caught and consumed in the Inner Harbor during the time of the study. The analysis will be conducted on whole fish, or on those portions of the fish that are typically consumed by local residents. Because children consume many of the fish from the Inner Harbor, these fish species will be particularly targeted. The collection methods will be the same as typically used by the consumers. This procedure may not be technically rigorous in assessing fish contamination, but will provide realistic data on the concentrations potentially ingested by consumers.

The constituents in the fish to be analyzed will be the same as specified in the permit. The permit also includes a requirement for water quality samples and sediment samples and parameters for analysis in addition to those required in the periodic sampling episodes. These samples and analyses will be conducted as specified and described in the permit and discussed in detail below.

2. Study Methods

The study includes the sampling and analysis of water, sediment, and fish samples. The water quality and sediment sampling and analysis methods will be the same as normally used for the Receiving Water Quality Monitoring Program (Special Condition E) and the Sediment Monitoring (Special Condition F). These methods have been previously reviewed and approved by USEPA and ASEPA during the previous permit studies. Some minor modifications are included in the Permit conditions referenced, and will be incorporated and followed.

2.1 Water Quality Samples

The water quality analyses will be expanded for the fish tissue study as described in the permits. Table 1 shows the routine and expanded (bold face) stations and parameters (station locations are further described in the NPDES Permits).

Temperature, dissolved oxygen (DO), pH, conductivity, and turbidity shall be measured as continuous vertical profiles at each station. Salinity will be calculated from temperature and conductivity. In the event of malfunctions of the sensors used to measure the continuous vertical profile parameters, direct measurement of grab samples, in the field, will be acceptable. Light penetration shall be measured at all stations by measurement of secchi depth. All other required parameters shall be measured in grab samples taken at one meter below the surface, mid-depth, and one meter above the bottom. In locations where the depth is greater than 40 meters, samples shall be taken at one meter below the surface, 20 meters, and 40 meters. Composite samples will be equal volumes of the three depths at the indicated stations.

Table 1. Water Quality Sampling during Fish Tissue Study

<u>Parameter</u>	<u>Units</u>	<u>Stations</u>	<u>Sample Type</u>
Temperature	°F	5, 8, 18, 14, 15, 16, 8A, 11, 13	Vertical profile
Salinity	PSU (ppt)	5, 8, 18, 14, 15, 16, 8A, 11, 13	Vertical profile
pH	SU	5, 8, 18, 14, 15, 16, 8A, 11, 13	Vertical profile
Dissolved Oxygen	mg/l and %Sat	5, 8, 18, 14, 15, 16, 8A, 11, 13	Vertical profile
Turbidity	NTU	5, 8, 18, 14, 15, 16, 8A, 11, 13	Vertical profile
Turbidity	NTU	18, 14, 15, 16	Grab
Light Penetration	feet	5, 8, 18, 14, 15, 16, 8A, 11, 13	Direct Reading
Suspended Solids	mg/l	5, 8, 18, 14, 15, 16, 8A, 11, 13	Grab
Chlorophyll-a	mg/l	5, 8, 18, 14, 15, 16, 8A, 11, 13	Grab
Total Ammonia	mg/l	5, 8, 18, 14, 15, 16, 8A, 11, 13	Grab
Total Nitrogen	mg/l	5, 8, 18, 14, 15, 16, 8A, 11, 13	Grab
Total Phosphorous	mg/l	5, 8, 18, 14, 15, 16, 8A, 11, 13	Grab
Copper	µg/l	5, 8, 8A, 11, 13, 14, 15	Grab
Zinc	µg/l	5, 8, 8A, 11, 13, 14, 15	Grab
Lead	µg/l	5, 8A , 11, 11A , 12 , 13, 14, 15	Grab
Mercury	µg/l	5, 8A , 11, 11A , 12 , 13, 14, 15	Grab
Arsenic	µg/l	5, 8A , 11, 11A , 12 , 13, 14, 15	Grab
Aroclor 1260		5, 11, 13	Composite
DDT, DDE, DDD		5, 11, 13	Composite
Dioxin		13	Composite

2.2 Sediment Quality Samples

During the routine sediment sampling seven sites are occupied within Pago Pago Harbor and analyzed for total nitrogen, total phosphorous, percent organics, percent solids, volatile solids, grain size distribution, oxidation-reduction potential, sulfides, copper, zinc, lead, mercury, and arsenic. Three sites are located in inner Pago Pago

Harbor and four sites are located in the middle and outer portion of the harbor (station locations are further described in the NPDES Permits). During the fish tissue sampling three additional Inner Harbor stations will be included (4, FD, SWM). Station locations are listed below:

<u>Station</u>	<u>Vicinity</u>	<u>Location</u>
IH1	Inner Harbor	Between old outfalls
IH2	Inner Harbor	Offshore of old outfalls
IH3	Inner Harbor	Off Pago Pago stream
OH1	Outer harbor	400' NNW of outfall
OH2	Outer harbor	400' SSE of outfall
OH3	Outer harbor	Utulei outfall
OH4	Outer harbor	Reference
4	Inner Harbor	South end of cannery cocks
FD	Inner Harbor	Fuel Dock
SWM	Inner Harbor	Southwest marine

The sediment quality analyses will be expanded for the fish tissue study as described in the permits. Table 2 shows the routine and expanded (bold face) stations and parameters. In addition, if possible, the sediment sampling event done in conjunction with the fish tissue study will include core samples at the Inner Harbor stations. The canneries will make a reasonable attempt to collect core samples and, if successful, analysis will be done using material from two levels in the cores (or at the lower level from the core and a surficial grab sample). Dioxin will be measured in only one sample, which will be a composite from two core layers or the surficial sample if a core sample cannot be obtained.

Table 2. Sediment Quality Sampling during Fish Tissue Study

<u>Parameter</u>	<u>Units</u>	<u>Routine Stations</u>	<u>Expanded Stations</u>
Total Nitrogen (TKN)	mg/kg (dry)	IH1, 2, 3; OH1, 2, 3, 4	
Total Phosphorous	mg/kg (dry)	IH1, 2, 3; OH1, 2, 3, 4	
Total Sulfides	mg/kg (dry)	IH1, 2, 3; OH1, 2, 3, 4	
Redox Potential	mV	IH1, 2, 3; OH1, 2, 3, 4	
Total Organic Carbon	%	IH1, 2, 3; OH1, 2, 3, 4	
Percent Solids	%	IH1, 2, 3; OH1, 2, 3, 4	
Total Volatile Solids	%	IH1, 2, 3; OH1, 2, 3, 4	
Grain Size	mm (distribution)	IH1, 2, 3; OH1, 2, 3, 4	
Copper	mg/kg	IH1, 2, 3; OH1, 2, 3, 4	
Zinc	mg/kg	IH1, 2, 3; OH1, 2, 3, 4	
Lead	mg/kg	IH1, 2, 3; OH1, 2, 3, 4	4, FD, SWM
Mercury	mg/kg	IH1, 2, 3; OH1, 2, 3, 4	4, FD, SWM
Arsenic	mg/kg	IH1, 2, 3; OH1, 2, 3, 4	4, FD, SWM
Aroclor 1260			IH3, OH4
DDT, DDE, DDD			IH3, OH4
Dioxin			IH3

2.3 Fish Tissue Samples

Fish samples will be collected from the Inner Harbor. Three species will be collected, if possible, and three composite samples of each species will be frozen and transported to the laboratory (two for analyses and one for archive purposes). The samples will be hand carried by project staff from American Samoa to Seattle and then delivered to the laboratory. The analyses indicated in Table 3 will be conducted. A single sample selected by project staff in consultation with ASEPA staff will be analyzed for dioxin. It is recommended, in the absence of any other guidelines from ASEPA, that the fish caught in the greatest number at the time of the collection be used for the dioxin analysis. Samples will consist of up to five individual organisms and will be composited by the laboratory. Samples will be acquired in three ways, in the order of preference described below:

1. Fish being actively caught by residents will be purchased as they are caught and frozen immediately.
2. Local residents will be employed to catch fish that they would normally target for consumption using their normal fishing methods.
3. Project staff will collect fish in the inner harbor that are known to be consumed by local residents.

Samples will consist of up to five individuals of each species or group that will be composited. Immediately after collection, sample specimen will be carefully sealed in ziplock bags, and placed in a cooler with ice. Dioxin samples will be selected onsite and carefully wrapped in aluminum foil and then placed in ziploc bags and stored on ice. If whole fish are not to be analyzed, depending on the manner in which they are normally consumed, a clean lab processing station will be setup onshore to avoid field contamination sources. Any specimens that will be gutted or otherwise cleaned will only come into contact with pre-cleaned glass surfaces. The samples will be frozen the same day they are initially collected, and will be kept frozen until delivered to the laboratory.

Table 3. Fish Tissue Sampling

<u>Parameter</u>	<u>Fish Samples (2 Samples of each Species)</u>		
	Species A	Species B	Species C
Lead	X	X	X
Arsenic	X	X	X
Mercury	X	X	X
Aroclor 1260	X	X	X
DDT, DDE, DDD	X	X	X
Dioxin		X	

In the event that a sufficient number of samples of each species cannot be collected during the 2001 Tradewind sampling campaign, the number of species, and/or the number of samples per species will be adjusted. The final sample collection will be determined in consultation with ASEPA staff at the time of sample collection.

2.4 Fish Tissue Analysis

The sample analysis will be conducted by Columbia Analytical and the analytical techniques and detection limits will follow EPA approved methods as follows:

<u>Parameter</u>	<u>Method</u>	<u>Detection Limit</u>
Lead		
Arsenic		
Mercury		
Aroclor 1260		
DDT, DDE, DDD		
Dioxin		

Quality Assurance and Quality Control

The receiving water and sediment sampling will be conducted in the previously approved fashion. This includes instrument calibration, field-sampling techniques, and laboratory quality control measures normally used for these samples. The fish samples will be handled as follows:

- All samples will be obtained immediately after the fish are caught and identified to genus (if possible). Closely related species with similar life histories (e.g. grouper) may not be immediately identifiable to the genus or species level (as juveniles in particular) and may be grouped in single samples. Local experts will be consulted to assist in the fish identification.
- Each individual will be measured, weighed, and photographed. Field notes detailing the location, time, and methods of capture will be maintained.
- Samples will be immediately bagged and frozen with appropriate labels.
- Chain-of custody forms will be maintained from capture to laboratory.
- Samples will be transported as carry-on baggage by project staff and will be maintained frozen using "blue ice" or similar cold packs sufficient for the anticipated travel time. The samples will be stored in a freezer until delivery

to the laboratory. Arrangements to replace the ice packs in transit will be made prior to departure from American Samoa.

4. Reporting

Results of the study will be summarized and evaluated in a technical report, along with the supporting field and analytical documentation. The water quality and sediment quality sampling will be described in detail in separate reports, however the results of these studies will be duplicated in the fish tissue study report for convenience. This report will include:

- An introduction describing the objectives of the study and, to the extent possible, the relationship to the related studies by ASEPA,
- A description of the field and analytical procedures used,
- A summary of field sample collection as implemented and supporting data for the fish tissue sampling (e.g. location, field specimen photos, and specimen data sheets),
- Analytical chemistry results and supporting QA/QC documentation,
- An evaluation of the results, including a comparison to relevant literature values.